

- 44 -

The Claims Defining the Invention are as Follows

1. Apparatus for capturing wave energy in a body of water, the apparatus comprising a body structure having a portion thereof adapted to deflect in response to wave action, a pump defining a pumping chamber adapted to
5 undergo expansion and contraction in response to deflection of the portion of the body structure, the pumping chamber having an inlet communicating with a fluid source and an outlet, whereby fluid from the fluid source is drawn into the pumping chamber upon volume expansion thereof from the pumping chamber and is discharged through the outlet upon volume reduction thereof
10 through the outlet.
2. Apparatus according to claim 1 wherein the portion of the body structure adapted to deflect in response to wave action comprises a flexible diaphragm exposed to a body of water incorporating wave action.
3. Apparatus according to claim 2 wherein the diaphragm comprises a
15 substantially rigid portion and a flexible portion.
4. Apparatus according to claim 3 wherein the flexible portion surrounds the rigid portion.
5. Apparatus according to claim 3 or 4 wherein the pump is operably connected to the rigid portion.
- 20 6. Apparatus according to claim 3, 4 or 5 wherein the flexible portion comprises a flexible membrane on which the rigid portion is mounted.
7. Apparatus according to any one of claims 3 to 6 wherein there are a plurality of said rigid portions adapted for articulation one with respect to another to define an articulated structure.
- 25 8. Apparatus according to claim 7 wherein the rigid portions are disposed in a concatenate relationship extending in the direction of wave travel.

- 45 -

9. Apparatus according to claim 8 wherein the rigid portions are spaced apart in the concatenate relationship to permit angular movement therebetween.
10. Apparatus according to claim 9 wherein the rigid portions are mounted on the flexible portion, whereby the flexible portion provides a connection between adjacent rigid portions.
5
11. Apparatus according to any one of claims 5 to 10 wherein each rigid portion has a respective pump operably connected thereto.
12. Apparatus according to any one of claims 2 to 11 wherein the body structure comprises a hollow structure having an upper end closed by the diaphragm.
- 10 13. Apparatus according to claim 12 wherein the body structure includes a chamber which is disposed below the flexible diaphragm and which is adapted to contain a compressible fluid such as air.
14. Apparatus according to claim 13 wherein the chamber is adapted to undergo volume expansion and volume reduction upon deflection of the diaphragm,
15 with the compressible fluid contained within the fluid chamber being progressively compressed to yieldingly resist movement of the diaphragm in an inward direction corresponding to volume reduction of the chamber in response to wave pressure and to urge the diaphragm in the opposite direction upon abatement of the wave pressure.
- 20 15. Apparatus according to claim 13 wherein the volume of the chamber remains generally constant, the compressible fluid in the chamber being re-distributed within the chamber in response to deflection of the diaphragm without a substantial change in the volume and pressure thereof.
- 25 16. Apparatus according to any one of claims 1 to 13 wherein the body structure includes a plurality of chambers interconnected for fluid communication therebetween and containing a compressible fluid such as air, the chambers being disposed in a series substantially aligned with the direction of wave

- 46 -

travel, each chamber being disposed beneath a respective flexible diaphragm, the arrangement being that the diaphragms deflect in sequence in response to wave activity, with the fluid being re-distributed within the chambers to exert a restoring force on the diaphragms.

- 5 17. Apparatus according to any one of the preceding claims further comprising a valve system associated with the inlet and outlet of the or each pumping chamber, the valve system includes an inlet valve adapted to open upon volume expansion of the pumping chamber and adapted to close upon volume reduction of the pumping chamber, the valve system further includes an outlet
- 10 valve associated with the outlet, the outlet valve being adapted to close upon volume expansion of the pumping chamber and to open during volume reduction only after fluid contained within the pumping chamber thereof attains a prescribed pressure.
- 15 18. Apparatus according to any one of the preceding claims further comprising means for selectively blocking operation of any one or more of the pumping chambers.
19. Apparatus according to any one of the preceding claims wherein the pumping chamber has an elastomeric wall adapted to undergo extension and contraction corresponding to a volume change of the pumping chamber.
- 20 20. Apparatus according to claim 19 wherein the pump comprises a bellows structure constructed at least in part of elastomeric material.
21. Apparatus according to claim 20 wherein the bellows structure is configured as a bellows column supporting the diaphragm.
- 25 22. Apparatus according to claim 20 or 21 wherein the bellows structure comprises a plurality of annular discs formed of elastomeric material, the annular discs being assembled in side-by-side relationship concentrically on a common axis, the annular discs (apart from the two endmost discs) each being formed integrally with or connected to an adjacent disc on one side

- 47 -

thereof at the radially inner ends thereof and being formed integrally with or connected to an adjacent disc on the other side thereof at the radially outer ends thereof.

23. Apparatus according to claim 20, 21 or 22 further comprising stabilisation
5 means for laterally stabilising each bellows structure.

24. Apparatus according to claim 19 wherein the elastomeric wall comprises an elastomeric sheath cooperating with a piston, whereby reciprocating movement of the piston causes expansion and contraction of the elastomeric sheath, expansion of the elastomeric sheath corresponding to a volume
10 reduction of the pumping chamber and contraction of the elastomeric sheath corresponding to a volume expansion of the pumping chamber.

25. Apparatus according to claim 24 wherein the elastomeric sheath is supported on a wall of a hollow housing, whereby the elastomeric sheath is accommodated within the interior of the hollow housing and wherein the
15 pumping chamber is defined between the elastomeric sheath and the hollow housing.

26. Apparatus according to claim 25 wherein the piston extends through said wall of the hollow housing such that the elastomeric sheath is received thereon.

27. Apparatus according to any one of the preceding claims further comprising
20 means for selectively displacing said portion to compensate for tidal conditions.

28. Apparatus according to any one of the preceding claims further comprising damper means for progressively damping inward excursions of said portion in heavy sea conditions.

25 29. Apparatus according to any one of the preceding claims further comprising a holding chamber adapted to undergo volume expansion and contraction in response to deflection of said portion, the holding chamber being in fluid

- 48 -

- communication with the body of water to receive water therefrom upon volume expansion of the holding chamber, the inlet of the pumping chamber communicating with the holding chamber to receive water therefrom, whereby water from the holding chamber is drawn into the pumping chamber upon
- 5 volume expansion thereof and is discharged through the outlet in a pressurised condition upon volume reduction of the pumping chamber, and means for applying a selectively adjustable restoring force to said portion for biasing the holding chamber into a condition corresponding to volume expansion thereof.
- 10 30. Apparatus for capturing wave energy in a body of water, the apparatus comprising a body structure having a portion thereof adapted to move in response to wave action, a pump defining a pumping chamber adapted to undergo volume expansion and volume reduction in response to movement of the portion of the body structure, the pumping chamber having an inlet
- 15 communicating with a fluid source and an outlet whereby fluid from the fluid source is drawn into the pumping chamber upon volume expansion thereof through the inlet and discharged from the pumping chamber upon volume contraction thereof through the outlet, the pumping chamber being operatively connected to said portion, the pumping chamber having an elastomeric wall
- 20 adapted to undergo extension and contraction corresponding to a volume change of the pumping chamber.
- 25 31. Apparatus for capturing wave energy in a body of water, the apparatus comprising a body structure having a portion thereof adapted to deflect in response to wave action, a holding chamber adapted to undergo volume expansion and contraction in response to deflection of said portion, the holding chamber being in fluid communication with the body of water to receive water therefrom upon volume expansion of the holding chamber, a pumping chamber adapted to undergo expansion and contraction in response to deflection of the portion of the body structure, the pumping chamber having
- 30 an inlet communicating with the holding chamber to receive water therefrom and an outlet, whereby water from the holding chamber is drawn into the pumping chamber upon volume expansion thereof and is discharged through

- 49 -

the outlet in a pressurised condition upon volume reduction of the pumping chamber, and means for applying a selectively adjustable restoring force to said portion for biasing the holding chamber into a condition corresponding to volume expansion thereof.

- 5 32. Apparatus for capturing wave energy in a body of water, the apparatus comprising a body structure having a flexible diaphragm adapted to deflect in response to wave action, a pump defining a pumping chamber adapted to undergo expansion and contraction in response to deflection of the portion of the body structure, the flexible diaphragm comprising a flexible portion and a
10 rigid portion, the pump being operably connected to the rigid portion.
33. A wave energy capturing system comprising an array of units extending transversely of the wave direction in a spaced apart relation, each unit comprising apparatus according to any one of the preceding claims.
- 15 34. Apparatus substantially as herein described with reference to the accompanying drawings.